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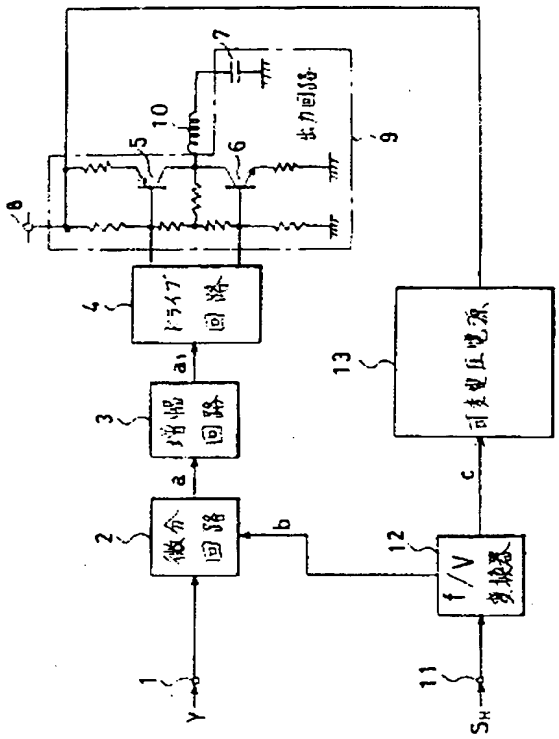
TITLE : OUTLINE CORRECTING DEVICE FOR VIDEO



ABSTRACT : PURPOSE: To increase the sharpness of a video by applying the horizontal scanning speed modulation of an optimum electron beam to two videos or more different in horizontal deflecting frequency, respectively.

CONSTITUTION: The horizontal synchronizing signal of a video signal is inputted to a terminal 11, and a frequency discriminating circuit 12 integrates horizontal synchronizing signal SH inputted in 1 vertical synchronizing period and outputs control signals (b) and (c) based on the voltage signal equivalent to the number of input signals For a variable voltage power source 13, an output voltage is changed over by the control signal (c). For a differentiation circuit 2, a peaking frequency is changed over by the control signal (b). When a horizontal deflecting frequency is higher, the peaking frequency of the differentiation circuit 2 is higher, the variable voltage power source 13 is driven by the high power source voltage, and reversely, when the horizontal deflecting frequency is lower, the peaking frequency of the differentiation circuit 2 is lower, and a variable power source voltage 13 is driven by the low power source voltage. As this result, the optimum outline correction can be attained.

AK

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⑫公開特許公報（A）　昭63－123275

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審査請求　未請求　発明の数 1　（全4頁）

⑭発明の名称　映像の輪郭補正装置

⑳特　願　昭61－270680
㉒出　願　昭61(1986)11月12日

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Jap. Pat. OPI No. 63-123275 (5-27-88)

明　細　書

1. 発明の名称

映像の輪郭補正装置

2. 特許請求の範囲

(1) 映像信号の水平偏向周波数を弁別する弁別手段と、この弁別された水平偏向周波数の高低に応じてピーキング周波数が高低に切換えられて上記映像信号の輝度信号成分を微分する手段と、陰極線管に配設されかつ当該陰極線管の電子ビームの水平走査速度を発生する磁界によつて変える変調コイルと、この変調コイルに上記輝度信号の微分信号波形の電流を通電する出力回路と、この出力回路を駆動する電圧を上記弁別された水平偏向周波数の高低に応じて高低に切換える可変電圧電源とを備えた映像の輪郭補正装置。

3. 発明の詳細な説明

〔産業上の利用分野〕

この発明は陰極線管の電子ビームの水平走査速度を映像信号に応じて変調することによつて再生画像の鮮鋭度を改善する輪郭補正装置に関するものである。

〔従来の技術〕

従来の輪郭補正装置としては、再生画像の輪郭部分を、プリシュートおよびオーバシュートにより強調する、いわゆるアパーチャ補正手段があり最も一般的である。しかし、このアパーチャ補正手段では、輝度の高い画像部分で電子ビーム電流が増大するため、電子ビームのスポットサイズが大きくなり、シュート幅が大きくなると同時にゆるやかになる現象が起こるので、再生画像の鮮鋭度はそれほど改善されない。

第8図は再生画像の輪郭部分の電子ビームの水平走査速度を変えることによつて鮮鋭度を向上させるようにした従来装置のブロック回路図で、(1)は映像信号中の輝度信号Yの入力端子、(2)は輝度信号を2回微分する微分回路、(3)は微分信号aを増幅する増幅回路、(4)はドライブ回路、(9)はトランジスタ(5)，(6)、コンデンサ(7)、定電圧電源(8)および抵抗で構成されているプッシュプル出力回路、(10)は図示していない陰極線管に装着されており、

出力回路(9)により微分波形電流が通電されて、発生する磁界により電子ビームの水平走査速度を変える変調コイルである。

第4図はこの従来装置の動作を説明するための波形図で、同図(a)は輝度信号Yの波形図、同図(b)は微分回路(2)から出力される2回微分信号aの波形図、同図(c)は変調コイル(10)に流れる変調電流波形図で1回積分されるので1回微分した波形となり、変調コイル(10)から同じ波形の磁束が発生し、この磁束によつて図示していない陰極線管内の電子ビームの水平走査位置が同図(d)に示すように変位される。同図(e)は陰極線管の表示面に映出された画像の輝度分布を示す図で、輝度信号の立上り部の前半部では電子ビームの水平走査速度が速いために暗くなり、後半部では逆に走査速度が遅くなるので明るくなる。また、輝度信号の立下り部分では前半部の走査速度が遅いので明るく、後半部では速いので暗くなる。したがつて、画像の輪郭が強調され、見かけ上、画像の鮮鋭度が向上する。

〔発明が解決しようとする問題点〕

従来の走査速度変調を施す輪郭補正装置は、例えば15.7 kHzの水平偏向周波数について最適設計されており、例えば31 kHzの水平偏向周波数の映像信号を映出すると、輪郭補正を行うことができない。この理由は、微分回路(2)のピーキング周波数が第2図(a)に示すように約3 MHzであるので、水平偏向周波数の高周波化にともなつて画像の輪郭を示す周波数成分が約6 MHzになつたのに適合できず、また、水平偏向周波数の高周波化にともなつて変調コイル(10)のインピーダンスが増大するため、変調用電流が小さくなり、変調磁界が弱くなるため、変調量が少なくなるためである。

この発明は上記のような問題点を解決するためになされたもので、2以上の水平偏向周波数の映像信号についてもそれぞれ最適な輪郭補正を行うことのできる輪郭補正装置を得ることを目的とする。

〔問題点を解決するための手段〕

この発明は映像信号中の輝度成分を微分した波形の電流を変調磁界を発生する変調コイルに通電し、その変調磁界で電子ビームの水平走査速度を変調するように構成されている輪郭補正装置において、上記映像信号の水平偏向周波数を弁別する手段と、当該水平偏向周波数の高低に則して映像信号の輝度信号を微分する回路のピーキング周波数を高低に切換える手段と、同じく水平偏向周波数の高低に則して上記変調コイルに通電する出力回路を駆動する電源電圧を高低に切換える手段とを備えた点に特徴を有する。

〔作用〕

水平偏向周波数が高いときには微分回路のピーキング周波数を高く、かつ、高い電源電圧でもつて出力回路を駆動し、逆に水平偏向周波数が低いときには微分回路のピーキング周波数を低く、かつ、低い電源電圧でもつて出力回路を駆動するようにしたので、水平偏向周波数の異なる2以上の映像信号を映出する場合であつても、最適な輪郭補正を行うことができ、画像の鮮鋭度が向上する。

〔発明の実施例〕

以下、この発明の一実施例を第1図により説明する。図において、第3図と同一符号はそれぞれ同一または相当部分を示しており、(11)は映像信号の水平同期信号が入力される端子、(12)は映像信号の周波数弁別回路で、この例は、1垂直同期期間内に入力される水平同期信号S_Hを積分し、入力信号数に相当する電圧信号にもとづいて制御信号b, cを出力するf／V変換器、(13)は制御信号cにより出力電圧が切換わる可変電圧電源、また、微分回路(2)は制御信号bによりピーキング周波数が切換えられる。この実施例は、水平偏向周波数が15.7 kHzの映像信号V_1と、31 kHzの映像信号V_2とに対応できるように構成されており、f／V変換器(12)から15.7 kHzであることを示す制御信号b, cが出力されているときには、微分回路(2)のピーキング周波数は約3 MHzにピークをもつ第2図(a)の特性に、また、可変電圧電源(13)の出力電圧は50 Vに設定される。また、f／V変換器(12)から31 kHzであることを示す制御信号b, cが出力されているときには、微分回路(2)のピーキング周波数は第2図(b)に示すように、約6 MHzにピ

ークをもつ特性に、また、可変電圧電源(13)の出力電圧は１００Ｖに切換えられる。このように、水平偏向周波数の高低に則してピーキング周波数および出力回路の駆動電源電圧を切換えることにより、それぞれ変調コイル(10)に適切な変調電流を通電することができるので、適切な輪郭補正を行うことができ、映像の鮮鋭度を向上させることができる。

なお、上記実施例では、１５.７ｋＨｚと８１ｋＨｚの２つの映像信号を対象とした例を示したが、この例に限られるものではなく、３以上の水平偏向周波数の映像信号にも同様に適用できる。

また、水平偏向周波数の弁別手段はｆ／Ｖ変換器で構成したがこの例に限られるものではない。

さらに上記実施例では、出力回路をプシュプル方式のトランジスタ回路で構成したが、この例に限られるものではない。

〔発明の効果〕

この発明は、映像信号の水平偏向周波数を弁別し、その周波数の高低に則して輝度信号を微分する回路のピーキング周波数を高低に切換える手段と、電子ビームの水平走査速度を変える変調コイルに上記微分信号波形の電流を通電する出力回路の駆動電圧電源を高低に切換える手段とを備えた輪郭補正装置であるから、水平偏向周波数の異なる２以上の映像に対してそれぞれ最適な電子ビームの水平走査速度変調を行うことができ、映像の鮮鋭度を改善できる効果が得られる。

4. 図面の簡単な説明

第１図はこの発明の一実施例のブロック回路図、第２図はこの実施例の微分回路のピーキング周波数特性を示す図、第３図は従来の輪郭補正装置のブロック回路図、第４図はその動作を説明するための波形図である。

(2)…微分回路、(9)…出力回路、(10)…電子ビームの水平走査速度変調コイル、(12)…ｆ／Ｖ変換器（水平偏向周波数弁別手段）、(13)…可変電圧電源。

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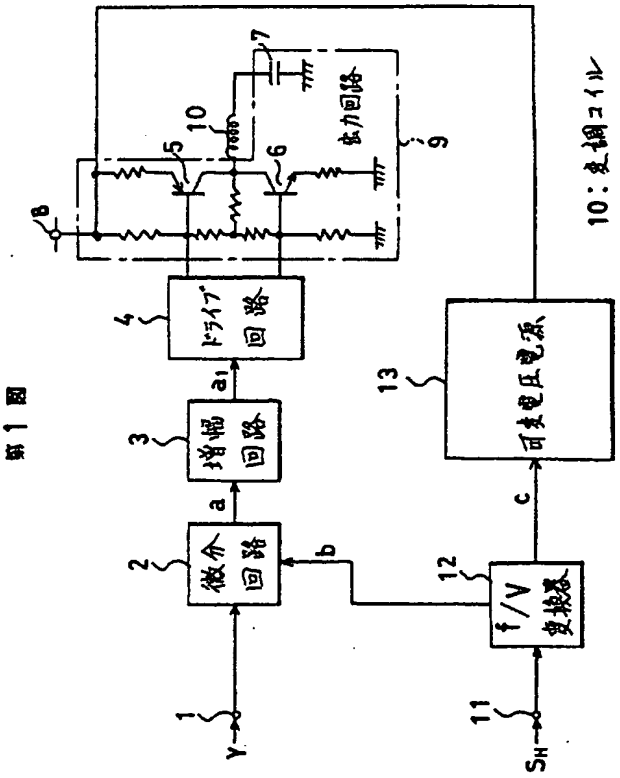
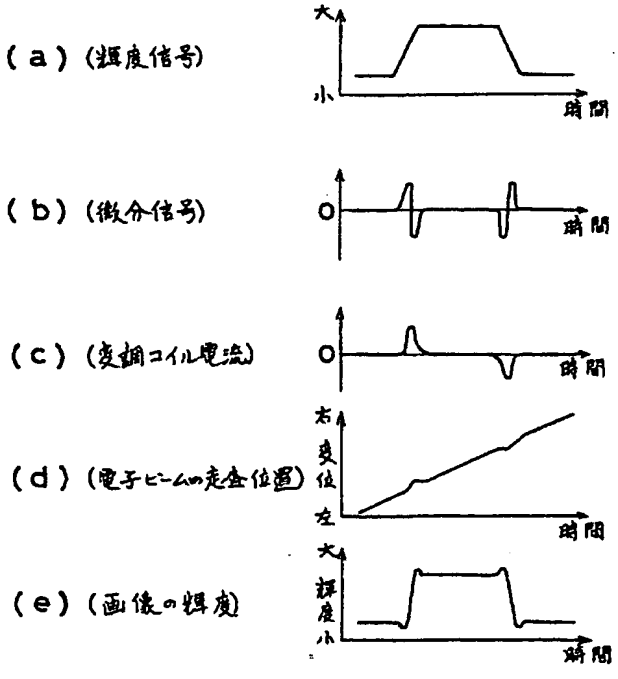
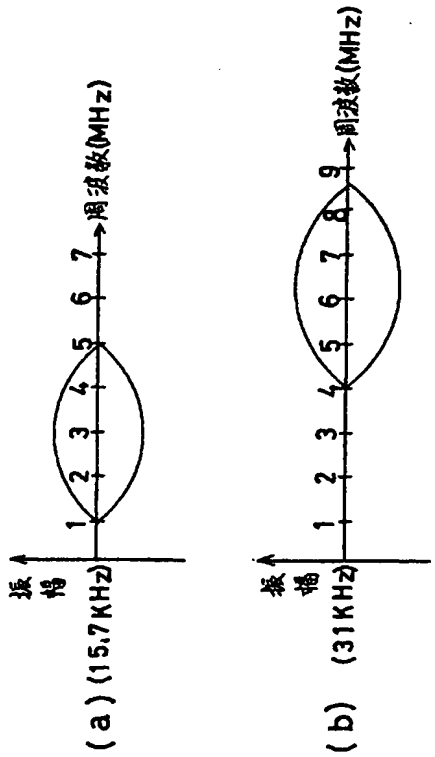
第１図



第４図



第2図


振幅
周波数(MHz)
1
2
3
4
5
6
7
(a) (15.7KHz)
振幅
周波数(MHz)
1
2
3
4
5
6
7
8
9
(b) (31KHz)

第3図

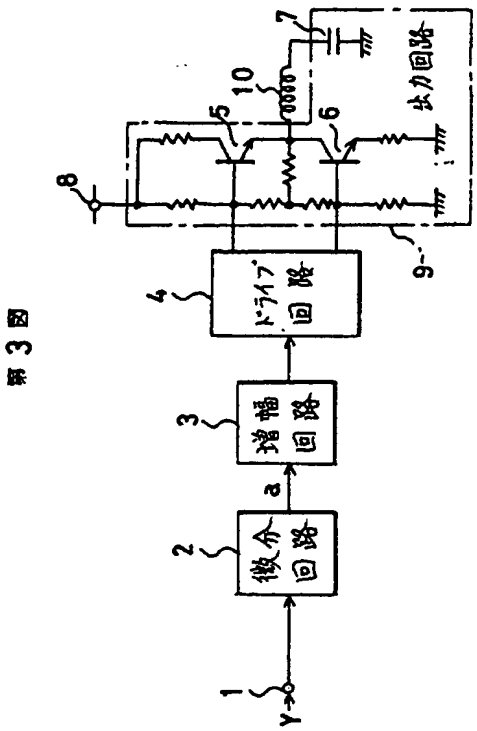

1
Y
2
微分回路
a
3
増幅回路
4
ドライブ回路
5
6
7
8
9
10
出力回路

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IMAGE CONTOUR ENHANCEMENT DEVICE

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[There are no amendments to this patent.]

Claim

Image contour enhancement device characterized by the fact that it has the following parts: a detection means which detects the horizontal deflecting frequency of the video signal; a means which switches the peak frequency to high/low levels corresponding to the high/low levels of the detected horizontal deflecting frequency, and which differentiates the luminance signal component of said video signal; a modulating coil which is set in the CRT and changes the horizontal scanning rate of the electron beam of the CRT by the generated magnetic field; an output circuit which sends the current with the differentiated signal waveform of said luminance signal to the modulating coil; and a variable voltage power source which switches the voltage for driving said output circuit to high/low levels corresponding to the high/low levels of said detected horizontal deflecting frequency.

Detailed explanation of the invention

Industrial application field

The present invention pertains to an image contour enhancement device which can improve the sharpness of the playback image by modulating the horizontal scanning rate of the electron beam of the CRT corresponding to the video signal.

Prior art

For conventional contour enhancement devices, the contours of the playback image are usually enhanced by a so-called aperture correcting means, which adjusts preshoot and overshoot conditions. However, for the aperture correcting means, since parts of the image with high brightness correspond to an increase in the electron beam current, the spot size of the electron beam becomes larger, the shoot width becomes larger, and at the same time, contours become blurred. Due to this phenomenon, the sharpness of the playback image is not significantly improved.

Figure 3 is a block circuit diagram illustrating a conventional device which improves the sharpness by changing the horizontal scanning rate of the electron beam for the contour portions of the playback image. (1) represents the input terminal for luminance signal Y from the video signal; (2) represents a differentiating circuit which calculates the second derivative of the luminance signal; (3) represents an amplifier which amplifies the differential signal a; (4) represents a driver; (9) represents a push-pull output circuit made of transistors (5) and (6), capacitor (7), constant-voltage power source (8) and resistors; and (10) represents a modulating coil which is installed in a CRT not shown in the figure, and which changes the horizontal

scanning rate of the electron beam by means of the magnetic field generated by the current with the differentiating waveform from output circuit (9).

Figure 4 is a waveform diagram illustrating the operation of the conventional device. Figure 4(a) shows the waveform of luminance signal Y; Figure 4(b) shows the waveform of the second-order differential signal a output from differentiating circuit (2); and Figure 4(c) shows the waveform of the modulating current flowing in modulating coil (10), which is a first-order differential waveform because integration has been performed once. A magnetic flux with the same waveform is generated by modulating coil (10), and, due to this magnetic flux, the horizontal scanning position of the electron beam in the CRT not shown in the figure is displaced as shown in Figure 4(d). Figure 4(e) shows the distribution of image brightness displayed on the CRT screen. In the first half of the rising portion of the luminance signal, as the horizontal scanning rate of the electron beam increases, the brightness decreases. Conversely, during the latter half, as the scanning rate decreases, the brightness increases. Also, during the falling portion of the luminance signal, the scanning rate is lower, resulting in brighter output during the first half, and the scanning rate is higher, resulting in darker output during the latter half. Consequently, the contours of the image are enhanced and the sharpness of the image is increased when the image is viewed.

Problems to be solved by the invention

For conventional contour enhancement devices that perform horizontal scanning rate modulation, optimum performance is achieved for a horizontal deflecting frequency of, say, 15.7 kHz. Consequently, when a video signal with horizontal deflecting frequency at, say, 31 kHz, is to be displayed, it is impossible to perform contour enhancement. The reason is as follows. As shown in Figure 2(a), the peaking frequency of differentiating circuit (2) is about 3 MHz. Consequently, as the horizontal deflecting frequency is increased, the frequency component corresponding to the display of the image contours is about 6 MHz. Consequently, this circuit becomes inappropriate. Also, as the horizontal deflecting frequency is increased, the impedance of modulating coil (10) becomes higher. Consequently, the modulating current decreases and the modulating magnetic field becomes weaker, so that the modulating amount becomes smaller.

The purpose of the present invention is to solve the aforementioned problems of the prior art by providing an image contour enhancement device characterized by the fact that it can perform optimum contour enhancement even for video signals of two or more horizontal deflecting frequencies.

Means to solve the problems

The present invention provides an image contour enhancement device characterized by the fact that it has the following parts: a detection means which detects the horizontal deflecting frequency of the video signal; a means which switches the peaking frequency to high/low levels corresponding to the high/low levels of the detected horizontal deflecting frequency, and which differentiates the luminance signal component of said video signal; a modulating coil which is set in the CRT and changes the horizontal scanning rate of the electron beam of the CRT by the generated magnetic field; an output circuit which sends the current with the differentiated signal waveform of said luminance signal to the modulating coil; and a variable voltage power source which switches the voltage for driving said output circuit to high/low levels corresponding to the high/low levels of said detected horizontal deflecting frequency.

Operation

As the horizontal deflecting frequency increases, the peaking frequency of the differentiating circuit increases, and the output circuit is driven by a higher power source voltage. On the contrary, when the horizontal deflecting frequency is lower, the peaking frequency of the differentiating circuit is lower, and the output circuit is driven by a lower power source voltage. Consequently, even when two or more video signals of different horizontal deflecting frequencies are to be displayed, it is still possible to perform optimum contour enhancement, so that the sharpness of the image can be improved.

Application examples

In the following, the present invention will be explained in more detail with reference to an application example illustrated by Figure 1. In Figure 1, the same part numbers as those in Figure 3 are used to represent identical or equivalent parts. In addition, (11) represents a terminal for the input of the horizontal sync signal of the video signal, and (12) represents a frequency detection circuit for the video signal. In this example, the frequency detection circuit is an f/V converter which integrates the horizontal sync signal SH input during one vertical sync period and outputs control signals b, c based on the voltage signal corresponding to the input signal number. (13) represents a variable voltage power source which has an output voltage that can be switched by means of control signal c. Also, differentiating circuit (2) can switch the peaking frequency by means of control signal b. In this application example, the configuration is designed to handle a video signal V_1 with a horizontal deflecting frequency of 15.7 kHz and a video signal V_2 with a horizontal deflecting frequency of 31 kHz. When f/V converter (12) outputs control signals b, c indicating 15.7 kHz, the peaking frequency of differentiating circuit (2) is set to the characteristic curve shown in Figure 2(a) with a peak at about 3 MHz, and the

output voltage of variable voltage power source (13) is set to 50 V. Also, when f/V converter (12) outputs control signals b, c indicating 31 kHz, the peaking frequency of differentiating circuit (2) is set to the characteristic curve shown in Figure 2(b) with a peak at about 6 MHz, and the output voltage of variable voltage power source (13) is set to 100 V. In this way, the peaking frequency and the driving power source voltage of the output circuit are switched corresponding to the high/low levels of the horizontal deflecting frequency, so that an appropriate modulating current flows in modulating coil (10) in each case. Consequently, appropriate contour enhancement can be realized, and the sharpness of the image can be improved.

In the aforementioned application example, two video signals of 15.7 kHz and 31 kHz are used as examples. However, the present invention is not limited to these. It may also be used for three or more video signals of different horizontal deflecting frequencies.

In the aforementioned application example, an f/V converter is used as the detection means for the horizontal deflecting frequency. However, the constitution is not limited to this means.

In the aforementioned application example, the output circuit is made of a push-pull transistor circuit. However, the present invention is not limited to this configuration.

Effect of the invention

The present invention provides an image contour enhancement device which has a means that can detect the horizontal deflecting frequency of the video signal so as to switch the peaking frequency of the differentiating circuit to high/low levels corresponding to the high/low levels of the frequency, and a means that switches the driving voltage power source to high/low levels for the output circuit which feeds the current of the aforementioned differentiating signal waveform through the modulating coil in order to change the horizontal scanning rate of the electron beam. Consequently, it is possible to perform horizontal scanning rate modulation for the electron beam in the optimum manner for two or more images of different horizontal deflecting frequencies. As a result, it is possible to improve the sharpness of the images.

Brief description of the figures

Figure 1 is a block circuit diagram illustrating an application example of the present invention. Figure 2 is a diagram illustrating the peaking frequency characteristics of the differentiating circuit in this application example. Figure 3 is a block circuit diagram illustrating a conventional contour enhancement device. Figure 4 is a waveform diagram illustrating the operation of the conventional contour enhancement device.

2 Differentiating circuit
9 Output circuit
10 Horizontal scanning rate modulating coil for electron beam
12 f/V converter (horizontal deflecting frequency detection means)
13 Variable voltage power source

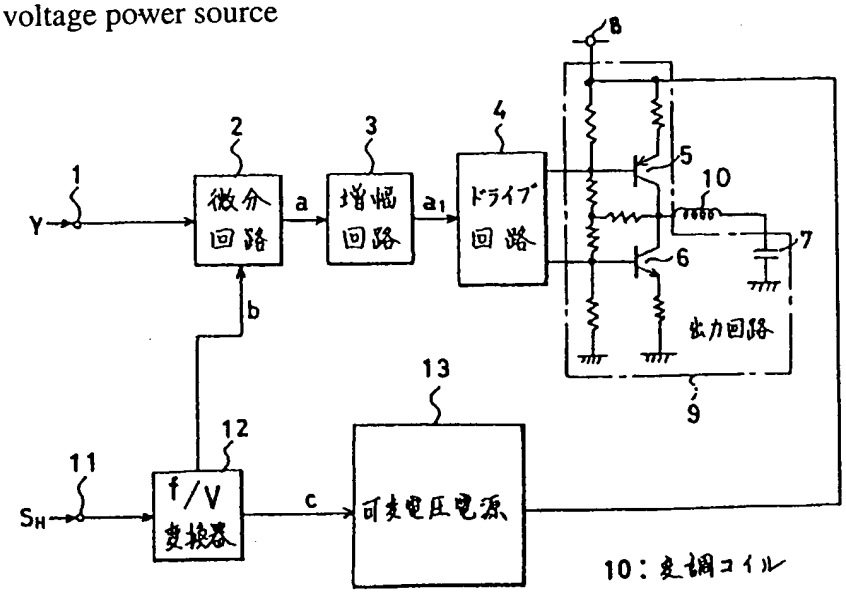

Figure 1

Key: 2 Differentiating circuit
3 Amplifying circuit
4 Driving circuit
9 Output circuit
10 Modulating coil
12 f/V converter
13 Variable voltage power source

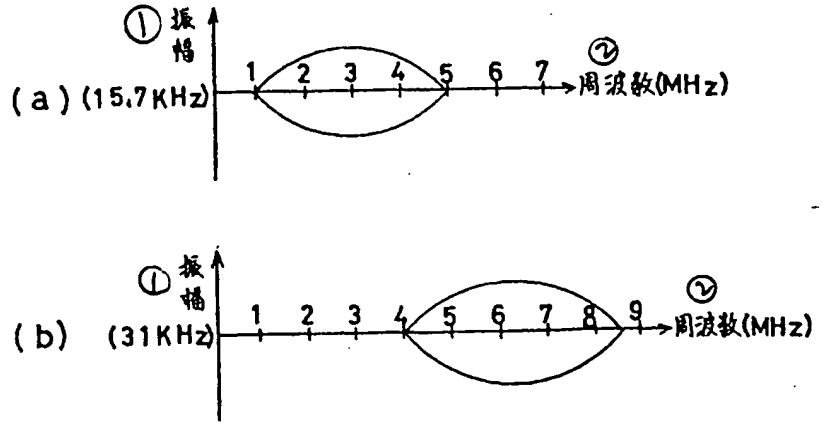

Figure 2

Key: 1 Amplitude
2 Frequency

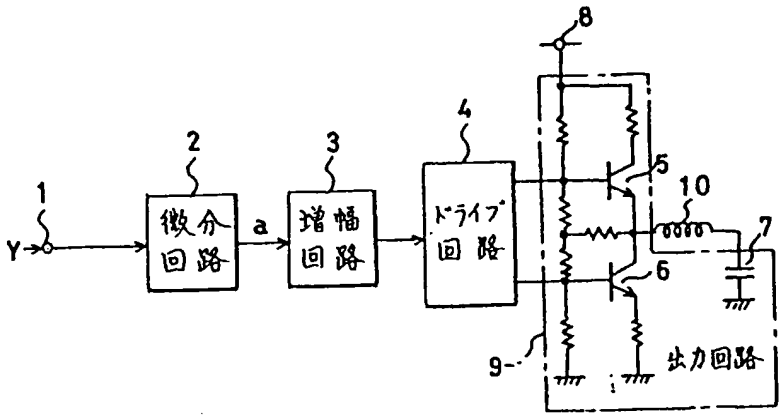

Figure 3

Key: 2 Differentiating circuit
3 Amplifying circuit
4 Driving circuit
9 Output circuit

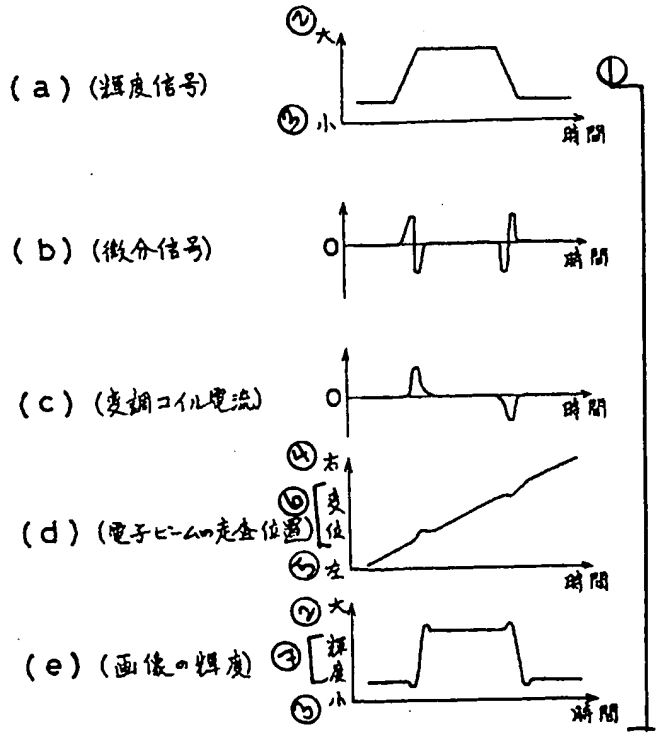

Figure 4

Key:
(a) (Luminance signal)
(b) (Differentiating signal)
(c) (Current in modulating coil)
(d) (Scanning position of electron beam)
(e) (Brightness of image)
1 Time
2 Larger
3 Smaller
4 Right
5 Left
6 Displacement
7 Brightness